CLAIMS:

1. A new method for the conjugation of chorin *e*6 to transferrin by first immobilizing transferrin to an anion exchange gel. as described in the summary of the invention: Synthesis of Chorin e6-transferrin. Said gel is, but is not limited to, quaternary aminoethyl-sepharose (hereafter referred to as QAE sepharose); all solid supports such as polystyrene, cellulose, etc., containing quaternary amine or positively charged functional groups can be used for the preparation of chorin e6-transferrin.

2. The claim of 1 where the immobilized transferrin is reacted with chlorin *e*6 in the presence of, but not limited to, 1-Ethyl-3-[3-dimethylaminopropyl] carbodiimide hydrochloride (hereafter referred to as EDC), in the presence of a detergent, and the synthesized conjugate released using high salt. The coupling agent is, but is not limited to EDC. Other commonly used compounds such as cyclohexyl-3(2-morpholinoethyl) carbodiimide can serve the same function.

3. The claim of 1 and 2, where the presence of a detergent is required for optimum formation of and release of the conjugate from the gel. The detergent is, but not limited to 3-[(3-cholidamidopropyl) dimethylammonio]- 1-propanesulfonate (hereafter referred to as CHAPS). Other detergents, such as octyl glucoside, Triton X-100, Tween20, etc. can serve the same function.

4. Preparation of transferrin-QAE sepharose. The claim of 1,2, and 3, wherein iron-free or iron saturated transferrin from any species is immobilized or bound to, but not limited to, quaternary aminoethyl-sepharose while in a solvent of, but not limited to, 20 mM phosphate buffer, pH 7.4 (20 mM Na2HPO4, adjusted to pH 7.4 with KH2PO4; hereafter referred to as PB) containing a detergent of, but not limited to, CHAPS, at a concentration of, but not limited to, 2 mM (solvent hereafter referred to as PB/CHAPS); and the gel is washed free of unbound transferrin in like solvent, after binding occurs to saturation and completion.

5. Preparation of chlorin e6-transferrin-QAE sepharose. The claim of 1, 2, 3, and 4 where 4, but not limited to 4, volumes of chlorin *e*6 in, but not limited to, PB/CHAPS is added to 1, but not limited to 1, volume of washed transferrin-QAE sepharose, and to this is added 0.25, but not limited to 0.25, volumes of EDC in a solvent of, but not limited to, purified water; and this mixture is incubated for, but not limited to, 20 minutes, at, but not limited to, room temperature, all while mixing, or by the use or any methodology, to ensure a uniform reaction which proceeds to saturation and completion.

6. Preparation of chlorin e6-transferrin-QAE sepharose, alternate to aim 5. The claims of 1, 2, 3, and 4, where chlorin e6 at, but not limited to, 1 mg/ml, dissolved in, but not limited to, PB/CHAPS is combined with EDC at, but not limited to, 1 mg/ml (initially dissolved at, but not limited to, 10 mg/ml in, but not limited to, water), for, but not limited to, 20 minutes, at, but not limited to, room temperature, and subsequently

exposed to an excess of QAE-sepharose in, but not limited to, PB/CHAPS for, but not limited to, 20 minutes, at, but not limited to, room temperature; wherein the desired modified chlorin e6 remains unbound to and is separated from the gel by, but not limited to, centrifugation. Where 4, but not limited to 4, volumes of this modified chlorin *e*6, is added to 1, but not limited to 1, volume of washed transferrin-QAE sepharose, and this mixture is incubated for, but not limited to, 20 minutes, at, but not limited to, room temperature, all while mixing, or by the use or any methodology, to ensure a uniform reaction which proceeds to saturation and completion.

7. The claim of 5 and 6 wherein the chlorin e6-transferrin-QAE-sepharose and other insoluble material is washed of free chorin e6, modified chlorin e6, and other soluble material by, but not limited to, repeated centrifugation from and re-suspension in a solvent of, but not limited to, the PB/CHAPS solvent of claim 5.

8. The claim of 7 wherein the formed chlorin e6-transferrin is released from QAE sepharose by exposure to, but not limited to, PB/CHAPS containing, but not limited to, 0.5 M NaCl.

10. The claim of 8 wherein the released chorin e6-transferrin is freed of the high salt buffer or placed in a new solvent system by, but not limited to, dialysis. The claim whereby other methodologies such as, but not limited to, gel filtration or ultrafiltration, are used to eliminate the salt from the chlorin *e*6-transferrin.

11. The claim of 10 whereby chlorin e6-transferrin is further purified by being placed in a low pH solvent of, but not limited to 25 mM sodium acetate, pH 4.8, and is reacted with a negatively charged matrix such as, but not limited to, sulfo-propyl sepharose, in a solvent of, but not limited to 25 mM sodium acetate, pH 4.8; whereby the chlorin e-transferrin binds to the matrix and any free, un-modified chlorin e6 does not.

12. The claim of 11 whereby chlorin e6-transferrin immobilized to sulfo-propyl sepharose is washed free of soluble material by, but not limited to, repeated centrifugation from and re-suspension in a solvent of, but not limited to, 25 mM sodium acetate, pH 4.8.

13. The claim of 10, 11, and 12 where the sulfo-propyl sepharose bound chlorin e6-transferrin is released by, but not limited to, PB/CHAPS containing, but not limited to, 1.0 M NaCl, and is placed in a new solvent by, but not limited to, dialysis.

14. The claim of 1, 10, and 13, where said transferrin-chlorin *e*6 conjugate is added to cells in culture. The cells are, but not limited to, tumor cells. The tumor cells are, but not limited to, breast cancers, melanoma, etc., and all other cells or tumor cells possessing substantial amount of functional transferrin receptors or other factors causing transferrin binding to, association with, or internalization into the cells.

15. The claim of 14 where said cultured tumor cells or other cells associated with chorin e6-transferrin are damaged or destroyed by exposure to light.

16. The claim of 1, 10, and 13, where said chlorin e6-transferrin conjugate is delivered into tumor bearing humans or animals by, but not limited to, injection, or other methods such as , but not limited to, catheter, etc.

17. The claim of 16 where said chorin e6-transferrin-tumor cells residing in said humans or animals are damaged or destroyed by exposure to light, where said light is any light source capable of converting chlorin *e*6 to the toxic form, including, but not limited to, fluorescent, incandescent, and laser light.

18. The claim of 1, 10, 13, 16, and 17 where said transferrin is purified from, but not limited to, the blood, serum, or plasma of a cancer patient or animal, is then conjugated with chlorin *e*6, delivered into that patient or animal, and that patient's or animal's tumor(s) is irradiated by light.

19. The claim of 17 and 18 where tumor cells in the treated patient or animal are damaged or destroyed directly by the chorin *e*6-transferrin/light therapy, or indirectly from subsequent destruction of light-damaged tumor cells by other events such as, but not limited to, recognition and destruction of light-damaged tumor cells by the immune system, and the patient's or animal's prognosis is improved

20. The claim of 16, 17, 18, and 19 where circulating chorin *e*6-transferrin-tumor cells are destroyed by passage of the patient's blood through a light-irradiation instrument positioned outside the body.

21. The claims of 16, and 17, where transferrin-binding, associating, or internalizing cells other than tumor cells are selectively destroyed using these methods, in the treatment of other conditions or diseases.

22. The claims of 16 and 17 where treatment of cancer-bearing humans or animals by administration of chlorin *e*6-transferrin followed by light exposure is used as an adjunct treatment for cancer, or any other condition, alongside existing conventional or other treatments.

23. The claims of 16 and 17 wherein said treatment of humans or animals by administration of chlorin *e*6-transferrin followed by light exposure is repeated multiple times to eliminate disease or for other purposes.

24. The claims of 1, 14, 15, 16, and 17, wherein said treatment of cultured cells or humans or animals by administration of chlorin *e*6-transferrin followed by light exposure is used for any diagnostic or research purposes.

25. The claim of 1, 10, 13, 16, and 17, wherein said transferrin is likewise conjugated with chlorin *e*6 and utilized in any way, whether activated to the toxin form or not, or activated to the toxin form in any way, by any methodology.